

A Model Process for Setting Military Injury Prevention Priorities and Making Evidence-Based Recommendations for Interventions

Military Training Task Force White Paper



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**Military Training Task Force White Paper:
A Process for Setting Military Injury Prevention Priorities
and Making Evidence-Based Recommendations for Interventions**

Executive Summary

Over the last several decades, tremendous strides have been made in the process of making evidence-based recommendations for preventing injuries and other public health problems in civilian and military populations. Until recently, the “gold standard” for the quality of research supporting prevention and treatment was the randomized trial. Especially for complex problems like injuries, it is difficult to conduct randomized trials, so other types of studies must be relied on in the decision-making process. Additionally, randomized trials by their very nature often do not address factors important in policy-making decisions, such as cost and feasibility.

It has also become increasingly evident that systematic reviews of the existing scientific literature, often an important source of information for policymakers, are necessary but not sufficient for deciding the most effective and efficient ways to prevent injuries and allocate resources. Proposed programs and policies should be evaluated using criteria that encompass a variety of characteristics, from the magnitude of the problem and degree of concern, to the strength of the scientific evidence, to the existence of the necessary infrastructure to support the program or policy. For optimum success, evaluation criteria must be unbiased and objective, and the process used to prioritize proposed programs and policies should be transparent.

This white paper describes two military and civilian work groups consisting of injury prevention and safety subject matter experts. These work groups developed and used a process with the elements described above to:

1. Set military injury prevention priorities, and
2. Make recommendations for physical training-related injury prevention programs and policies.

The process was developed and applied in two stages.

- The first stage developed and tested a set of criteria to objectively identify Service-wide (specifically, Army-wide) injury problems and prioritize these problems for the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) Injury Prevention Program.
- The second stage, conducted by the Joint Services Physical Training Injury Prevention Work Group (JSPTIPWG), established the evidence base needed for making recommendations for the prevention of injuries associated with physical training and applied a set of criteria to objectively determine the highest priorities for physical training injury prevention.

The Military Training Task Force (MTTF) was briefed on the work of these two work groups. In March 2005, the MTTF Chairman requested a white paper on the processes used by the work groups.

PURPOSE: The purpose of this paper is to describe the two stages of a process for setting injury prevention priorities and making evidence-based recommendations for programs and policies

that address leading injury problems. The paper proposes that the approaches used by these two groups could be combined to establish a model process to:

- Identify the largest, most severe injury problems for the Services;
- Describe the existing scientific evidence for leading injury issues and make program and policy recommendations based on this evidence and;
- Prioritize injury prevention programs and policies using a set of criteria that enables an objective evaluation of proposed prevention initiatives based on factors that contribute to the eventual success or failure of programs and policies.

The paper should be useful to decisions makers, Commanders, and medical and safety professionals at the DoD, Military Service, and Major Command levels who have responsibility for preventing injuries and/or enhancing troop readiness, interpreting and/or tracking medical, safety, or readiness trends, or directing and managing research and development and health resources.

PROCESS: Based on the work and deliberations of the two work groups, the critical steps in the process of setting priorities for injury prevention and research include these objectives:

- Evaluate existing personnel, medical, and safety surveillance data (deaths, disabilities, hospitalizations, outpatient visits, medical evacuations, safety/accident data, and other) to identify the injury problems with the greatest impact on health and readiness for each of the Services.
- Identify and evaluate military and civilian research on prevention programs and policies related to important injury problems through a systematic review process.
- Weigh the strength of the evidence from identified studies and make recommendations for or against specific interventions related to leading injury problems.
- Apply criteria that balance the strength of the evidence for an intervention against other considerations (e.g., practicality, sustainability) to arrive at objective, evidence-based priorities.
- Where recommendations for immediate prevention opportunities cannot be made based on existing evidence, apply criteria for setting research priorities to make recommendations for future allocation of research resources. This process would involve assessing the costs and benefits of gathering further information.

RECOMMENDATION: By applying this approach, the DoD will be assured of focusing on the largest, most preventable injury problems in the most cost-effective manner. To accomplish these objectives, a panel of military and civilian injury and preventive medicine experts should be impaneled to refine the process and tailor it for DoD and Service-specific needs.

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BACKGROUND

Injuries represent the leading health problem of U.S. military personnel across the spectrum of health from deaths and disabilities, to hospitalization and outpatient treatment (Jones et al. 1999; Jones and Amoroso 2000). More serious injuries result from accidents than any other cause (i.e., illness, intentional injuries, hostile action), even in combat (Writer and DeFraites 2000; Jones and Amoroso 2000; Hauret et al. 2004). As a consequence of knowledge about the magnitude of the injury problem for the U.S. Military, the Secretary of Defense mandated in 2003 that rates of accidents and injuries must be significantly reduced (see Appendix A).

The Defense Safety Oversight Council (DSOC) Military Training Task Force (MTTF) was created to support the Secretary of Defense's accident and injury prevention mandate. In support of the DSOC mission, in 2005, the Chairman of the MTTF requested that this White Paper be written to describe a process for setting unbiased, objective injury prevention priorities and for making evidence-based recommendations for prevention programs and policies. This paper will first provide background on the problem of injuries and recent approaches to determining what works to prevent them. Next it will describe a model process that could be used to more effectively and efficiently set priorities and implement successful injury and accident prevention programs and policies.

Emerging Concepts in Health Policy Decision-Making

The 1988 Institute of Medicine (IOM) report, *The Future of Public Health*, identified ad hoc public health decision-making as a common obstacle to successful program and policy development and implementation. The report stated:

“...policy development in public health at all levels of government is often *ad hoc*, responding to the issues of the moment rather than benefiting from careful assessment of existing knowledge, establishment of priorities based on data, and allocation of resources according to an objective assessment of the possibilities for greatest impact.” (pp. 114-115)

The report recommended that every public health agency should “regularly and systematically collect, assemble, analyze and make available information on the health of the community...” and promote “...use of scientific knowledge in decision-making about public health...” (p. 141). However, little guidance about how to do this was provided in the report.

A number of accomplishments have improved the public health and injury prevention process since the 1988 IOM report. One of the most fundamental achievements was the delineation and

application of the steps of the public health process to injury prevention (Jones and Amoroso 2000, pp. 71-84). The five steps of the public health prevention process are:

1. Surveillance of health problems
2. Research to identify modifiable causes and risk factors
3. Research and intervention trials aimed at prevention
4. Prevention program and policy implementation
5. Monitoring (surveillance) and evaluation to determine effectiveness of programs and policies

The first step of the process is perhaps the most important because surveillance helps determine whether a problem exists and how important it is relative to other causes. Also, surveillance provides the mechanism for follow-up and monitoring whether a program or policy change has had a beneficial impact. The civilian and military communities have both made progress towards improving each of these steps of the injury prevention process since injuries were first recognized as a major public health problem for the Nation and the Military in the 1980s.

Surveillance and Injury Prevention

Since the publication of another pivotal IOM Report, *Injury in America: A Continuing Public Health Problem* in 1985, virtually all injury reports at the national or state level have identified injury surveillance as a critical first step (Rice et al. 1989; National Committee for Injury Prevention and Control 1989; State and Territorial Injury Prevention Directors Association 1977; Bonnie et al. 1999). Military reports (Jones et al. 1999; Jones and Amoroso 2000) have made the same recommendation for improving the use of medical surveillance data in the priority-setting and decision-making process. Although the use of surveillance and other data was recommended as an important first step, guidance about how to use such data was sparse. As a result, injury prevention programs in the civilian community remained focused on preventing the most visible, most catastrophic injuries--those resulting in death (primarily motor vehicle fatalities). Military safety programs also focused on the prevention of motor vehicle and aviation-related deaths.

Two military reports (Jones et al. 1999; Jones and Amoroso 2000) produced in the 1990s identified the medical, safety, and administrative databases that could be used for injury surveillance of military populations and evaluated the potential value of each database for routine surveillance. The military reports, like the previously cited civilian reports, noted that while the major focus of injury prevention has been on deaths, non-fatal injuries compose the biggest portion of the problem and have the biggest impact on soldier health and readiness. Annually, military service members make almost 2,000,000 outpatient visits for treatment of acute and chronic injuries, about half of which require a day or more of limited duty. For the Army, Soldiers experience over 5,000 non-fatal injuries for every injury-related death. Furthermore, as with civilian injuries, motor vehicle-related injuries are not the predominant cause of non-fatal injuries. Falls, physical training, and sports emerge as more important causes of injuries. Data such as these clearly indicate a need to shift the focus of military injury prevention more towards non-fatal injuries. They also illustrate the potential value of non-fatal injury data in problem assessment and decision-making. Authors of the IOM Report, *Reducing*

the Burden of Injury (Bonnie et al. 1999) agreed; the report noted that improvement in non-fatal injury surveillance is a prerequisite for informed policy-making.

Systematic Reviews and Evidence-Based Decision-Making

At about the time that the full magnitude of the injury problem for the Nation and the Military received recognition in the late 1980s and early 1990s, another critical innovation in public health decision-making occurred. The publication of the Guide to Clinical Preventive Services by the U.S. Preventive Services Task Force (USPSTF) in 1989 signaled a shift from reliance on expert opinion to a more scientific, evidence-based decision-making approach to defining medical practice guidelines (McGinnis and Foege 2000). The Task Force applied a set of predetermined criteria to select health conditions targeted for prevention. Next, prevention measures for the selected conditions were identified and evaluated using explicit, predetermined criteria for assessing effectiveness. The first application of this process was made to disease prevention in the clinical setting (USPSTF 1989). By the late 1990s, the value of this process for making decisions about what works to prevent injuries was recognized (USPSTF 1989; Rosenstock and Thacker 2000; Wagenaar 1999).

In a related effort, in 1996, the Task Force on Community Preventive Services met for the first time to lay the foundation for a Guide to Community Preventive Services, a companion guide to the clinical prevention guide described above (Zaza et al. 2000; Briss and Pappaioanou 2000). Fifteen public health topics were included in the Community Guide. Topics ranged from the modification of health risk behaviors, such as tobacco and alcohol use, to the reduction of mental impairment and disabilities. Motor vehicle crashes were the only category of unintentional injury to be selected for inclusion in the Guide. That section of the Guide, *Reducing Injuries to Motor Vehicle Occupants* (Zaza 2001), was published as a supplement to the American Journal of Preventive Medicine in 2001 and represented a growing appreciation of the value of systematic reviews of the existing literature. The Journal had previously published two other systematic reviews of injuries, *Systematic Reviews of Strategies to Prevent Motor Vehicle Injuries* (Rivera and McKenzie 1999) and *Systematic Reviews of Strategies to Prevent Occupational Injuries* (Rivera and Thompson 2000). Other systematic reviews of specific injury topics relevant to the Military have been reviewed and published in a variety of journals--topics such as stretching (Thacker et al. 2004), stress fractures (Jones et al. 2002), and ankle sprains (Thacker et al. 1999).

Over the last several years, at the same time that systematic reviews have been increasingly relied on to make decisions about what treatments and preventive measures work, there has been a growing recognition that such reviews alone are not sufficient to make policy decisions (Atkins et al. 2005; Helfand 2005; Claxton et al. 2005; Teutsch et al. 2005). Even the view that randomized clinical trials (RCTs) are the “gold standard” of evidence for effectiveness has been called into question (Claxton et al. 2005; Teutsch et al. 2005). It has been suggested that other types of studies, certain observational designs, may be valuable when RCTs have not been conducted or are not feasible. Furthermore, other observational study types may provide important information that RCTs do not (e.g., information on harms or adverse effects, costs and benefits, adequacy of resources, and other factors) (Claxton et al. 2005; Teutsch et al. 2005). Non-RCT study types may also provide more timely information. In their introductory comments

in the Guide to Community Preventive Services, McGinnis and Foege (2000) stated that classically-structured RCTs and similar rigorously-controlled patient interventions “often do not lend themselves well to conclusive results when applied to community-wide interventions.” Furthermore, for many problems, few if any RCTs have been done, yet decisions to protect military and civilian populations from health threats must be made. McGinnis and Foege (2000) suggested that public health may need to develop a more appropriate “evaluative calculus” that does not depend on or focus on results from RCTs.

Criteria for Setting Public/Military Health Priorities

Although the fields of public health and injury prevention have made much progress in developing surveillance systems and in assessing available scientific evidence since the publication of the NAS report in 1989, much remains to be done (Bonnie et al. 1999; Fowler 2001). It is evident that simply using surveillance to identify the size and severity of health problems is not enough to establish public or military health priorities. Likewise, evaluating the strength of the scientific evidence on the effectiveness of interventions by itself does not provide sufficient grounds for making decisions on priorities and allocation of resources. With a few exceptions, systematic criteria for setting injury prevention priorities have not been developed or employed. The 1999 IOM report (Bonnie et al.), *Reducing the Burden of Injury*, stated: “The challenge for the field is developing these criteria for setting priorities” (p. 267).

Whatever criteria are used, the process for making decisions should be transparent so that stakeholders know and have confidence in how decisions were made (Teutsch et al. 2004; Bonnie et al. 1999). Invariably, such a systematic, evidence-based process will find gaps in knowledge where evidence to support decision-making is not available. In instances where the decision-making process identifies a gap in necessary information, a mechanism is needed to determine what further research is required and to evaluate the costs and benefits associated with gathering more evidence (Teutsch et al. 2004, p. 131; Claxton et al. 2004, p. 96).

Over the last few years several military work groups have been using surveillance data to define the problem of injuries for the Military Services and to identify the most important priorities for injury prevention. These same work groups also evaluated the strength of the evidence for interventions to prevent leading military injury problems.

PURPOSE

The purpose of this white paper is to describe a coherent process gleaned from recent military work groups for:

- Setting DoD priorities for injury prevention and research that incorporates important innovations in the public health approach and evidence-based decision making.
- Making recommendations for (1) immediate injury prevention policy and program implementation and (2) future research.

Two military and civilian work groups of injury prevention and safety subject matter experts developed a process for accomplishing these objectives. This process is suitable for use at the DoD, Military Service and Major Command levels.

The process was developed and applied in two stages. The first stage was conducted to develop and test a set of criteria that would enable an unbiased, objective determination of Service-wide (specifically, Army-wide) priorities for the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) Injury Prevention Program. The second stage was conducted by the Joint Services Physical Training Injury Prevention Work Group (JSPTIPWG) of the MTTF to establish the evidence-base needed to make recommendations for prevention of physical training-related injuries and to apply a set of criteria to objectively determine the highest priorities for physical training injury prevention. This paper proposes that the combination of these two developmental stages could be used for:

- Identifying the largest, most severe health problems for the Services.
- Prioritizing the implementation of programs and policies for prevention, and
- Establishing the evidence-base for making recommendations to prevent injuries in the most efficient, cost-effective manner possible.

The processes employed by these two military work groups will be used to illustrate a systematic approach to setting injury prevention priorities and identifying strategies most likely to be effective in preventing injuries. The successive stages of the process used by these military work groups are described in two parts of this white paper:

- Part I: Establishing Criteria-Based, Objective Prevention Priorities
- Part II: Making Evidence-Based Recommendations for Prevention

This combined process from the two work groups provides a model for the Military Services, and other federal, state and local agencies to target and prevent injuries more efficiently and effectively.

PART I: ESTABLISHING CRITERIA-BASED, OBJECTIVE PREVENTION PRIORITIES

The first stage of the development process took place at Johns Hopkins Center for Injury Research and Policy (JHCIRP) in October 2002, when a group of 14 injury experts (see Appendix B) comprising the USACHPPM-JHCIRP Army Injury Prevention Priorities Work Group (USACHPPM-JHCIRP Work Group) met for a one-day workshop to:

- review Army injury surveillance data,
- review existing criteria for setting public health priorities,
- recommend additional criteria, and
- apply the criteria to score and rank major causes of Army injuries.

Appendix C shows an outline of the process used to prioritize USACHPPM injury prevention program and policy initiatives.

The USACHPPM-JHCIRP Work Group established five main categories of criteria for setting priorities, with two to six factors within each main category (Table 1). As a trial of the process, the group applied the criteria to 25 causes of injury that encompassed the leading causes of deaths, hospitalizations and outpatient visits for the Army (see Table 2).

Table 1. Five Main Criteria Categories for Rating Injury Problems and Assigned Points

Main Criteria Categories	Points
Consistent with USACHPPM Mission (no points scored but process stopped if problem not consistent with mission)	0
Importance of Problem to Force Health and Readiness	10
Preventability of Problem (evidence existed that problem could be prevented)	10
Feasibility of Implementing Program or Policy Recommendations	10
Evaluation of Recommended Program or Policy Possible	5

Table 2. 25 Causes of Unintentional Injury Hospitalization*

1. Accidents with own instruments of war	14. Machinery/tools
2. Athletics/sports	15. Marching/drilling
3. Complications of medical/surgical procedures	16. Military air transport accidents
4. Cut/pierced by object	17. Military vehicle accidents
5. Drowning/submersion	18. Nonmilitary air transport accidents
6. Excessive cold	19. Other environmental
7. Excessive heat	20. Physical training (e.g., running, calisthenics)
8. Falls/jumps	21. Poisoning
9. Fighting	22. POV accidents
10. Guns, explosives, and related devices	23. Twisting/turning/slipping
11. Hanging/suffocation	24. Unconventional weapons injury (chemical & biological weapons, terrorism)
12. Late effects of injury	
13. Lifting/pushing/pulling	25. Water transport

* Alphabetical list compiled from Atlas of Injuries in the U.S. Armed Forces, *Mil Med* 164(8):5-46.

Figure 1 displays the score sheet used for rating injury problems, with factors considered in applying the criteria. The maximum number of points any one rater could give a particular problem was 35. Given that 12 subject matter experts rated each problem (2 of the original 14 work group members did not participate), the maximum number of points that a particular problem could receive was 420 points (12 raters x 35 points).

Scores ascribed to different causes of injury ranged from a low of 91 to a high of 308. Scoring was conducted electronically after the participants returned to their usual duty sites. The top five Army injury problems identified by this process, and the scores received for each, were:

1. Physical Training – 308
2. Privately Owned Motor Vehicles – 271
3. Athletics and Sports – 261
4. Excessive Heat – 255
5. Military Vehicles – 252

In setting their internal priorities, the USACHPPM Injury Prevention Program decided not to focus on privately owned vehicles because (1) it is already a priority of the Army Combat Readiness Center (formerly the Army Safety Center), and (2) civilian organizations such as the National Highway Traffic Safety Administration and the National Center for Injury Prevention

and Control at the Centers for Disease Control devote much time and energy to the problem. Heat injuries were also not made an internal priority because the U.S. Army Research Institute of Environmental Medicine focuses on this problem. Falls and jumps (246 points) and marching and drilling (243 points) were subsequently picked up as priorities. The list has been a useful tool in determining the injury problems on which to focus limited resources.

The USACHPPM-JHCIRP Work Group also devised a draft set of criteria for setting research priorities (Table 3). This set of criteria differs from the criteria used to evaluate programs and policies. This will be of value in discussions about research priorities later in this paper.

Table 3. Criteria for Rating and Prioritizing Injury Problems Requiring Military-Sponsored Research

Consistent with Mission	<ul style="list-style-type: none"> • Consideration stops if problem or solution is not consistent with agency mission
Importance of Problem	<ul style="list-style-type: none"> • Magnitude and severity of problem • High costs of problem • Size and/or vulnerability of population at risk • Degree of concern (command or public) • Gaps in knowledge exists • Military uniqueness
Potential Value of Research	<ul style="list-style-type: none"> • Cross-cutting (cuts across types of injury) • Likelihood of identifying discrete modifiable risk factors • Demonstrated preventability in civilian population
Feasibility	<ul style="list-style-type: none"> • PM and medical infrastructure exists to support research efforts • Research partners exist • Technologic feasibility of doing research (ability to collect data) • Adequacy of resources

Figure 1. USACHPPM Criteria for Prioritizing Injury Programs and Policies

Criteria	Preliminary Rating	Final Score
A. PROGRAM OR POLICY IS CONSISTENT WITH MISSION	<input type="checkbox"/> YES <input type="checkbox"/> NO	If YES – Continue with scoring. If NO – Stop here.
B. IMPORTANCE OF PROBLEM TO FORCE HEALTH & READINESS <i>Considerations:</i> 1. Magnitude and severity of problem (consider its effect on personnel readiness) 2. Cost of the problem (consider training, property, and personnel costs) 3. Size and/or vulnerability of population at risk 4. Degree of concern (consider command concern, public concern, visibility of problem)	1. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 2. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 3. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 4. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High	(10 points; 1=low, 10=high)
C. PREVENTABILITY OF PROBLEM (10 points) <i>Considerations:</i> 1. Cause(s) are identifiable. 2. Risk factors are modifiable. 3. Proven prevention strategies exist. 4. Prevention strategies can be designed.	1. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 2. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 3. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 4. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High	(10 points; 1=low, 10=high)
D. FEASIBILITY OF PROGRAM OR POLICY (10 points) <i>Considerations:</i> 1. Existence of infrastructure to support implementation of the program or policy (consider medical staff & facilities, safety staff & resources, cadre availability). 2. Adequacy of funding to support implementation. 3. Authority to implement the program or policy is held or obtainable by the implementing organization(s). 4. Program or policy will not undermine essential missions. 5. Political and cultural acceptability of program or policy. 6. Accountability & responsibility for implementation exists or can be established.	1. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 2. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 3. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 4. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 5. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 6. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High	(10 points; 1=low, 10=high)
E. EVALUATION OF PROGRAM OR POLICY (5 points) <i>Considerations:</i> 1. Ability to evaluate effects of program or policy exists (consider if a metric is possible). 2. Benefits of program or policy outweigh the costs of implementation.	1. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 2. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High	(5 points; 1=low, 5=high)
TOTAL SCORE		

PART II: MAKING EVIDENCE-BASED RECOMMENDATIONS FOR PREVENTION

An example of the second stage of this process – making evidence-based recommendations for injury prevention strategies (i.e., interventions) to address leading injury problems – was conducted by the Joint Services Physical Training Injury Prevention Work Group (JSPTIPWG). The USACHPPM-JHCIRP Work Group had established that physical training-related injuries were a leading Army injury problem with great potential for prevention; a conclusion that was supported by studies showing physical training-related injuries were a leading cause of clinic visits and limited duty among all Services (Jones et al. 1999; Jones et al. 2000). Subsequently, the JSPTIPWG was chartered to make recommendations for the prevention of physical training-related injuries among military recruits based on existing scientific evidence of intervention effectiveness. The JSPTIPWG consisted of 20 members and 8 consultants/subject matter experts (see Appendix D for list of participants).

The steps of the JSPTIPWG's evaluation of the evidence base included:

- Developing literature search tactics to identify scientific reports relevant to physical training-related injury prevention,
- Listing known physical training-related injury prevention interventions,
- Conducting a literature search for studies related to physical training and exercise-related injury prevention interventions ,
- Culling studies from identified literature that did not meet specific inclusion criteria,
- Evaluating the scientific quality of the studies that met the criteria,
- Assessing the overall strength of the evidence for each intervention and “grading” each intervention using a rating scheme developed by the USPSTF,
- Developing criteria to objectively score and rank recommended interventions, and
- Applying those criteria to produce a prioritized list of recommended physical training-related injury prevention interventions.

The JSPTIPWG met twice by teleconference before meeting face-to-face for three days. The purposes of the phone conferences were to establish the systematic literature search and review process, develop inclusion and exclusion criteria for studies identified in the search process, and delegate responsibility for each of the intervention topics to be searched.

The initial list of topics included 27 interventions, which were divided into the following categories (see Appendix E-1 for a complete list of initial topics):

- Exercise/Training Programs
- Equipment and Environment
- Education
- Nutrition, Supplements and Hydration
- Medication and Medical Care
- Leadership/Accountability Issues
- Surveillance and Evaluation

The teleconference discussions expanded this original list of 27 interventions to 49 (see Appendix E-2 for expanded list). Each of the 49 intervention topics was assigned to teams of JSPTIPWG members who conducted literature searches, reviewed, and rated studies related to each intervention. An Intervention Studies Quality Scoring Form was created to facilitate the

study evaluation process (see Appendix F). At the time this paper was written, literature searches had been completed on 35 of the 49 original intervention topics. Intervention studies were identified for 23 (66%) of the 35 topics; no intervention studies were found in the literature for 12 (34%) of the topics.

Intervention study reviews were completed before the three-day face-to-face meeting. On the first day of the meeting, the group reviewed injury data showing the importance of the problem of physical training-related injuries for each of the Military Services. They discussed the recommendations from six previous expert panels and subject matter experts and cross-walked those with the topics researched by the JSPTIPWG. Then several key published PT-related injury intervention studies were reviewed prior to the JSPTIPWG's evaluation of interventions on their list.

On the second day of the meeting, the JSPTIPWG received briefings by JSPTIPWG members who led the literature review teams in the topic areas previously established. The briefings described the available studies and rated the quality of each. In that way, all 20 JSPTIPWG members had an opportunity to see and comment on the quality review scores. After reviewing all of the intervention topics on which literature searches had been completed, the JSPTIPWG assessed the strength of the evidence for those topics for which intervention studies were found. An adaptation of the USPSTF guidelines was used to categorize interventions as:

- Strongly Recommended
- Recommended
- No Recommendation For or Against (due to a close balance of benefits/harms)
- Recommend Against Use (due to evidence of ineffectiveness or harm)
- Insufficient Evidence to Make a Recommendation (recommend further research)

Of the 35 topics for which a literature search was completed, the JSPTIPWG found only 6 with sufficient scientific evidence to make a recommendation, as shown in Table 4. The fact that only 17% (6/35) of the interventions received scores high enough to recommend implementation indicates the value and the need for such an evidence-based review process.

Table 4. Six Recommended Interventions

Intervention	JSPTIPWG Recommendation
Running Volume (reduction in running frequency, duration, and distance: no PT on days when exhaustive military training occurs, run in ability groups by time, not distance, standardized and graduated/progressive exercise (including running) program, discontinue or modify use of PT as corrective tool and eliminate extra PT sessions for the least fit individuals - commonly known as “remedial PT”)	<p>We recommend use of initial fitness levels to develop a run program that emphasizes ability groups and intensity (interval training) to achieve Service-specific cardiorespiratory fitness standards. The JSPTIPWG found good evidence that programs that incorporate the following control the volume of running and thereby reduce injuries:</p> <ul style="list-style-type: none"> • Limit total run frequency and duration (mileage) for those individuals with lower fitness levels. • Standardize a gradual, systematic run progression. • Recognize that physiological thresholds exist above which increases in duration and frequency do not result in commensurate increases in cardiorespiratory fitness, but do result in higher injury rates, particularly for people with average and below-average fitness levels. • Consider total time on the feet (e.g., marching, travel time, administrative movements, drill and ceremony) in determination of run program. • Consider near-maximal or exhaustive military training as the equivalent of a strenuous PT session.
Body Movement Skills	<p>We recommend specific exercises to improve body movement skills (agility, posture, stability, flexibility, balance, speed, power, reactive ability, and coordination) as they relate to military occupational task performance. Focus on improvement of movement techniques during execution of exercise. The JSPTIPWG found good evidence that increasing the proportion of PT time devoted to these exercises reduces injuries.</p>
Mouth Guards to Reduce Oral-facial Injury	<p>Mouth guards are strongly recommended for all individuals participating in high-risk military activities for oral-facial injuries such as combatives, obstacle courses, rifle/bayonet training, etc. and contact sports such as basketball, football, etc.</p> <p>The JSPTIPWG found good evidence that mouth guards reduce oral-facial injuries.</p>
Ankle Bracing – Injured (i.e., history of previous injury—ankle, knee, etc.)	<p>Semi-rigid ankle braces are strongly recommended for individuals with previous moderate or severe ankle sprains when participating in high risk physical activity, e.g., obstacle courses, basketball, volleyball, soccer, etc. The JSPTIPWG found good evidence that semi-rigid ankle braces reduce ankle re-injuries.</p>
Nutritional Supplement and Hydration (pre nutrition and hydration; post PT nutrition and hydration)	<p>We recommend that a carbohydrate (CHO) protein snack* and CHO/electrolyte beverage be consumed within one hour after strenuous, prolonged, continuous physical activity of greater than one hour, e.g., prolonged road marching. Collateral benefits can be expected (e.g., reduction of heat related illness, enhanced performance, etc.).</p> <p>*Snack and beverage should be ≥ 50 and ≤ 75 grams of CHO CHO: Protein ≥ 4 (e.g., CarboPack, NSN 8970015054134, Natick Labs)</p>
Ankle Bracing – All	<p>Semi-rigid ankle braces are recommended for all individuals participating in high risk physical activity, e.g., basketball, movement or marching across rugged terrain, airborne operations. The JSPTIPWG found good evidence that semi-rigid ankle braces reduce ankle injuries.</p>

Additionally, enough data reviewed *contraindicated* the use of three interventions, shown in Table 5.

Table 5. Interventions Not Recommended for Implementation

Intervention	NOT Recommended
Pre-Exercise Stretching	The JSPTIPWG found at least fair evidence that stretching is ineffective for preventing injuries and inefficient. Alternatively, recommend performing lower intensity, task-specific, dynamic activities to warm-up prior to more intense training instead of stretching. For example, before running, perform brisk walking and light jogging to increase heart rate and body temperature (i.e., a light sweat). This recommendation against pre-exercise stretching is independent of other recommendations for stretching performed for injury rehabilitation.
Taping for Uninjured Ankle	The JSPTIPWG found that there is insufficient evidence that ankle taping prevents ankle sprains.
Non-Steroidal Anti-Inflammatory Drugs (NSAID)	The JSPTIPWG found at least fair evidence that the risks of NSAID loading prior to exercise outweigh the benefits. (Note: Complications may include GI upset, GI bleed, kidney and liver damage, delayed-muscle healing and heat injury.)

At the end of the second day, the JSPTIPWG refined a set of “strawman” criteria for establishing priorities among the recommended interventions. The JSPTIPWG arrived at the following set of criteria to rank recommended interventions and establish priorities (points associated with each criterion in parentheses):

- Strength of the Evidence (20 pts)
- Magnitude of the Effect (20 pts)
- Practicality/Feasibility (20 pts)
- Timeliness of Reduction in Injury Rates (10 pts)
- Sustainability (10 pts)
- Measurable Outcomes (10 pts)
- Collateral Benefits (10 pts)

Appendix G displays the scoring form and Criteria for Ranking Interventions. Each recommended intervention was rated on a 5-point scale, with 1 being low and 5 being high, for each of the seven criteria listed above. The points given by raters were then divided by 5 and multiplied by the maximum number of points for specified criteria and the products added to get the total points for a particular intervention (100 points maximum). Mean scores and rankings of injury interventions are listed in Table 6.

Table 6. Six Recommended Interventions– Mean Scores and Rankings

Intervention	Mean Score	Rank	SD	Median	Min	Max
Running Volume	86.3	1	8.5	87	68	100
Body Movement Skills	77.7	2	7.8	76	66	94
Mouth Guards	74.2	3	11.6	74	48	100
Ankle Bracing - Injured	70.1	4	10.3	68	50	90
Nutritional Supplement	67.0	5	11.6	66	54	94
Ankle Bracing - All	57.6	6	10.7	56	40	78

As discussed previously, public health decisions must often consider all available scientific evidence, not just RCTs. As a result, the next step of the evidence evaluation process was to identify other studies of value to decisions about injury prevention research priorities. JSPTIPWG members conducted further literature reviews to identify *all* published research related to the original topics. Studies considered for further review included research studies with injury and non-injury outcome(s) and reviews of injury research (see Appendix H). The JSPTIPWG members then classified the included studies into one of six study types:

- Intervention Studies (injury outcomes)
- Analytic Risk Factor or Cause Studies (injury outcomes)
- Descriptive Epidemiology Studies (injury outcomes)
- Clinical Case Series Studies (injury outcomes)
- Other Research (non-injury outcomes)
- Reviews

Study type definitions can be found in Appendix I. In this second round of reviews the JSPTIPWG members provided quality scores for the “Analytic Risk Factor and Cause Studies” using a score sheet similar to that used for interventions (see Appendix J). Quality scores were not computed for descriptive epidemiology, clinical case series, or reviews since these study types are not expected to significantly contribute to the intervention evidence base.

As a final step in the review process, the JSPTIPWG will apply a set of criteria specifically designed for setting research priorities to the physical training-related injury prevention topics examined (as opposed to prevention program and policy priorities). Criteria for research priorities will be similar to those suggested by the USACHPPM-JHCIRP Work Group (see Appendix C). These will provide the JSPTIPWG a foundation for making recommendations for further research and provided a prioritized list of its recommendations to the MTTF and DSOC.

RECOMMENDATIONS ON A PROCESS TO SET PRIORITIES AND PREVENT INJURIES

The work and deliberations of the two work groups discussed above can be used as a foundation for designing a systematic process to be used by DoD and the Military Services. Based on the experiences of the two work groups, the critical steps in the process of setting priorities for injury prevention and research include:

- Using existing injury, medical surveillance, safety, and personnel data (deaths, disabilities, hospitalizations, outpatient visits, medical evacuations, safety/accident and

other) to identify the injury problems with the greatest impact on health and readiness for each of the Services.

- Identifying and evaluating the quality of military and civilian research that supports development and implementation of prevention programs and policies for leading injury problems through a systematic review process.
- Weighing the strength of the evidence from identified studies to make recommendations for or against pursuing specific interventions for each problem area.
- Applying predetermined, objective criteria that balance the strength of the evidence for an intervention against other considerations such as practicality and sustainability to arrive at priorities.
- Where gaps in knowledge exist and recommendations for immediate prevention cannot be made based on existing evidence, applying criteria for setting research priorities to make recommendations on future allocation of research resources.

CONCLUSION

By applying this approach the DoD will be assured of attacking the largest, most preventable injury problems in the most cost-effective manner. To accomplish the recommendations, a panel of military and civilian injury and preventive medicine experts should be convened to refine the process and tailor it to DoD and Service-specific needs.

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Appendix A. Secretary of Defense Memorandum on Reducing Preventable Accidents



THE SECRETARY OF DEFENSE
1000 DEFENSE PENTAGON
WASHINGTON, DC 20301-1000

May 19, 2003

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
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ASSISTANT SECRETARIES OF DEFENSE
GENERAL COUNSEL OF THE DEPARTMENT OF
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INSPECTOR GENERAL OF THE DEPARTMENT OF
DEFENSE
DIRECTOR, OPERATIONAL TEST AND EVALUATION
ASSISTANTS TO THE SECRETARY OF DEFENSE
DIRECTOR, ADMINISTRATION AND MANAGEMENT
DIRECTOR, FORCE TRANSFORMATION
DIRECTOR, NET ASSESSMENT
DIRECTOR, PROGRAM ANALYSIS AND EVALUATION
DIRECTORS OF THE DEFENSE AGENCIES
DIRECTORS OF THE DOD FIELD ACTIVITIES

SUBJECT: Reducing Preventable Accidents

World-class organizations do not tolerate preventable accidents. Our accident rates have increased recently, and we need to turn this situation around. I challenge all of you to reduce the number of mishaps and accident rates by at least 50% in the next two years. These goals are achievable, and will directly increase our operational readiness. We owe no less to the men and women who defend our Nation.

I have asked the Under Secretary of Defense for Personnel and Readiness to lead a department-wide effort to focus our accident reduction effort. I intend to be updated on our progress routinely. The USD(P&R) will provide detailed instructions in separate correspondence.

A handwritten signature in black ink, likely belonging to the Secretary of Defense, is positioned above the recycling symbol.



U06916-03

Appendix B. USACHPPM-JHCIRP Army Injury Prevention Priorities Work Group

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Appendix C. USACHPPM-JHCIRP Work Group Process for Prioritizing Injury Prevention Programs and Policies

1. Assemble injury and safety experts.

- 14 participants in one-day workshop
- 8 Army, 6 non-Army
- Variety of disciplines: clinicians, epidemiologists, researchers, policymakers

2. Review existing Army injury data.

- Medical surveillance data on deaths, disabilities, hospitalizations, and outpatient visits, comparing injuries to all other diagnoses
- Cause of injury information collected during U.S. Army field studies and research projects
- Cause of injury information collected by the U.S. Army Safety Center

3. Review existing criteria.

Initial criteria developed at CDC's National Center for Injury Prevention and Control:

- Consistent with mission
- Magnitude of problem
- High costs of problem
- Size of population
- Degree of public concern
- Preventable problem
- Modifiable risk factors
- Proven prevention
- Public health & health infrastructure
- Adequacy of resources
- Benefits greater than costs
- Evaluation capability

4. Brainstorm additional criteria.

Additional criteria added by Work Group:

- Cause(s) are identifiable
- Prevention strategies can be designed
- Authority to implement the program or policy is held or obtainable by the implementing organization(s)
- Program or policy will not undermine essential missions
- Accountability & responsibility for implementation exists or can be established

5. Organize criteria.

Grouped into Five Main Criteria

- CONSISTENT WITH MISSION
- IMPORTANCE OF PROBLEM to force health and readiness
- PREVENTABILITY of problem
- FEASIBILITY of program or policy
- EVALUATION of program or policy

6. Assign scoring scheme and format score sheet (see Table C-1).

10 pts. – Importance
10 pts. – Preventability
10 pts. – Feasibility
5 pts. – Evaluation potential
35 pts. – TOTAL

7. Use criteria to evaluate and prioritize 25 causes of Army unintentional injury hospitalization (see Table C-2).

Table C-1. USACHPPM-JHCIRP Criteria for Prioritizing Injury Programs and Policies

Criterion	Preliminary Rating	Final Score
A. PROGRAM OR POLICY IS CONSISTENT WITH MISSION	<input type="checkbox"/> YES <input type="checkbox"/> NO	If YES – Continue with scoring. If NO – Stop here.
B. IMPORTANCE OF PROBLEM TO FORCE HEALTH & READINESS <i>Considerations:</i> 1. Magnitude and severity of problem (consider its effect on personnel readiness) 2. Cost of the problem (consider training, property, and personnel costs) 3. Size and/or vulnerability of population at risk 4. Degree of concern (consider command concern, public concern, visibility of problem)	1. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 2. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 3. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 4. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High	(10 points; 1=low, 10=high)
C. PREVENTABILITY OF PROBLEM (10 points) <i>Considerations:</i> 1. Cause(s) are identifiable. 2. Risk factors are modifiable. 3. Proven prevention strategies exist. 4. Prevention strategies can be designed.	1. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 2. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 3. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 4. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High	(10 points; 1=low, 10=high)
D. FEASIBILITY OF PROGRAM OR POLICY (10 points) <i>Considerations:</i> 1. Existence of infrastructure to support implementation of the program or policy (consider medical staff & facilities, safety staff & resources, cadre availability). 2. Adequacy of funding to support implementation. 3. Authority to implement the program or policy is held or obtainable by the implementing organization(s). 4. Program or policy will not undermine essential missions. 5. Political and cultural acceptability of program or policy. 6. Accountability & responsibility for implementation exists or can be established.	1. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 2. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 3. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 4. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 5. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 6. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High	(10 points; 1=low, 10=high)
E. EVALUATION OF PROGRAM OR POLICY (5 points) <i>Considerations:</i> 1. Ability to evaluate effects of program or policy exists (consider if a metric is possible). 2. Benefits of program or policy outweigh the costs of implementation.	1. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High 2. <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High	(5 points; 1=low, 5=high)
TOTAL SCORE		

Table C-2. 25 Causes of Unintentional Injury Hospitalization* Prioritized by the USACHPPM-JHCIRP Work Group

1. Accidents with own instruments of war	14. Machinery/tools
2. Athletics/sports	15. Marching/drilling
3. Complications of medical/surgical procedures	16. Military air transport accidents
4. Cut/pierced by object	17. Military vehicle accidents
5. Drowning/submersion	18. Nonmilitary air transport accidents
6. Excessive cold	19. Other environmental
7. Excessive heat	20. Physical training (e.g., running, calisthenics)
8. Falls/jumps	21. Poisoning
9. Fighting	22. POV accidents
10. Guns, explosives, and related devices	23. Twisting/turning/slipping
11. Hanging/suffocation	24. Unconventional weapons injury (chemical & biological weapons, terrorism)
12. Late effects of injury	
13. 13. Lifting/pushing/pulling	25. Water transport

* Alphabetical list compiled from Atlas of Injuries in the U.S. Armed Forces, *Mil Med* 164(8):5-46.

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Appendix E-1. JSPTIPWG Initial List of Physical Training-Related Injury Prevention Interventions by Category

I. Exercise/ Training Programs (as it relates to injury)

1. Running volume (intensity, duration, frequency, over load)
2. Fitness level (ability groups)
3. Other types of training (strength, cross training, job specific)
4. Preventives (warm-up/cool-down, proprioception, stretching)
5. Technique (stride length, short to tall formation)
6. Progression/Overload with increased fitness (standardization, preconditioning, remedial)
7. Recovery period (training and testing)
8. Elimination of harmful exercise/ avoidance of high risk exercise (deep knee bends, mule kick, sit-ups?, etc)
9. Exercise program management (separating weighing and fitness testing)

II. Equipment & Environment

10. Footwear (shoes, insoles, socks)
11. Joint support (bracing and taping)
12. Mouth guards, helmets, pads, and reflective material
13. Running and landing surfaces (obstacle course)
14. Environmental temperature

III. Education

15. Injury prevention
16. Health behavior (alcohol, smoking, other)
17. Technique (running form, safe lifting)
18. Health care provider (profile writing training)
19. Self treatment

IV. Nutrition, Supplements, and Hydration

V. Medication and Medical Care

20. Medications
21. Rehabilitation
22. Early intervention

VI. Leadership/ Accountability Issues

23. Responsibility for injury rates
24. Focus on PT pass performance
25. Psychosocial issues

VII. Surveillance & Evaluation

26. Command injury visibility
27. Screening: Injury Risk Index

Appendix E-2. JSPTIPWG Final List of Physical Training-Related Injury Prevention Interventions by Category and Sub-category

Category	Sub Category	Intervention
Exercise/Training Programs	1. Running Volume	Reduction in running frequency, duration, and distance
	2. Running Volume	Reinitiating exercise at lower intensity levels for the detrained (at what point of detraining should one revert to lighter training loads?)
	3. Running Volume	No PT on days when exhaustive military training occurs
	4. Running Volume	Increase marching while decreasing running
	5. Fitness Level	Run in ability groups by time, not distance
	6. Other types of training – Strength	[Pre-injury] Targeted muscle strengthening
	7. Other types of training – Cross Training	“Cross-training” (yoga, tai chi, aquatics for exercise)
	8. Other types of training – Job Specific	Job specific strength training - align conditioning with readiness physical demands
	9. Preventives	Warm-up / Cool-down
	10. Preventives	Multi-axial and Proprioceptive Training: training on non-stable platforms (e.g. wobble board, Swiss ball, etc)
	11. Preventives	Pre and Post Exercise Stretching
	12. Technique Training	Run and march at own stride length (rout step)
	13. Technique Training	Place shorter service members in front of formations to set running pace (if running or marching in step)
	14. Progression/ Overload with increased fitness	Standardized and graduated/progressive exercise (including running) program
	15. Progression/ Overload with increased fitness	Standardized Graduated Hiking Program
	16. Progression/ Overload with increased fitness	Introduction of flak vests in BCT: Increases in load bearing equipment
	17. Progression/ Overload with increased fitness	Pre-accession fitness program
	18. Progression/ Overload with increased fitness	Does mass or individual training in like units affect injury rates? If individual training produces similar performance with less injury, at what point in training might trainees direct their own training?
	19. Progression/ Overload – Remedial Exercise	Discontinue or modify use of PT as corrective tool

Category	Sub Category	Intervention
	20. Progression/ Overload – Remedial Exercise	Eliminate extra PT sessions for the least fit individuals (commonly known as “remedial PT”)
	21. Recovery	Determine the ideal and absolute minimum recovery period between maximal effort fitness tests
	22. Elimination/ Avoidance of harmful exercise	Avoidance of “harmful” exercises (e.g., deep knee bends, mule kicks, situps)
	23. Exercise Program Management	Would injury rates and performance be affected if body weight was assessed at a time other than a maximal effort physical fitness test?
Equipment & Environment	24. Footwear	Replace running shoes every 400-600 miles (are there shoe tests that can demonstrate ~500 miles of wear?)
	25. Footwear	Shock-absorbing insoles
	26. Footwear	Socks and antiperspirants to prevent blisters
	27. Footwear	Individual prescription of running shoe based on foot type
	28. Joint Support	Joint bracing (especially with history of previous injury – ankle, knee, etc)
	29. Joint Support	Ankle taping
	30. Equipment	Mouth guards, helmets, pads, reflective material
	31. Environment	Running surfaces that minimize injury
	32. Environment	Obstacle course landing areas and serial review of same
	33. Environment	Adjustment of training load by seasonal variations (when environmental temperatures are high)
Education	34. Injury prevention	Injury prevention education to leadership, cadre and troops
	35. Health behavior	Smoking and alcohol cessation programs
	36. Technique	Incorporate safe lifting technique training into PT
	37. Technique	Train service members in special awareness and core body movement and management skills (how to run, jump, land, cut, and decelerate)
	38. Health Care Provider Education	Health care professional profile writing – especially on BCT/AIT training
	39. Self treatment	Early cryotherapy self intervention (crushed ice and ice massage)
Nutrition, Supplements & Hydration	40. Nutrition, Supplements and Hydration	Pre and Post PT nutrition, supplementation, and hydration

Category	Sub Category	Intervention
Medication & Medical Care	41. Medications	Pre exercise loading anti-inflammatory medication
	42. Medications	BCP use increases knee stability (potentially reducing risk of ACL injuries in women)
	43. Rehabilitation	Standardized reconditioning program for the recently injured
	44. Early Intervention	Use of allied health professionals in locations more forward of fixed facility treatment (e.g., SMART clinics)
Leadership/ Accountability Issues	45. Leadership Accountability	Rate commanders and exercise leaders (trainers, drill sergeants, etc) on their unit injury rate (just as is done for average PT scores)
	46. Leadership Accountability	Rate commanders and exercise leaders on percent of individuals passing fitness test (instead of the average of just those who perform the test)
	47. Psychosocial	Psychosocial issues related to injury: peer, leader, and organizational influences; depression, stress, anxiety, and job satisfaction
Surveillance & Evaluation	48. Surveillance	Provide commanders injury rate information on their unit and challenge them to reduce it
	49. Screening	Can an injury risk index be developed that would categorize individuals by level of risk (a la Framingham Cardiac Risk Index) through survey and musculoskeletal evaluation – Assessing behavior and intrinsic risk factors such as: Age Gender Ethnicity Musculoskeletal strength and endurance Aerobic fitness History of physical activity Musculotendinous flexibility Tobacco use behavior (particularly smoking) BMI Foot arch height Knee Q-angle Injury history (especially ankle)

Appendix F. JSPTIPWG Intervention Studies Quality Scoring Form

Score each intervention study on a separate Intervention Studies Quality Scoring Form.

Author/Year/Title of Intervention Study:	
Date of Review:	Name of Reviewer:
Problem and Sample	Score
1. Is there a clear statement of research question or hypothesis? If yes, score 1.	
2. Is there a source of subjects or sample described (e.g., inclusion criteria listed)? If yes, score 1.	
3. Is there a clear description of intervention? If yes, score 1.	
Study Design and Methodology	
4. Is it a randomized controlled trial? If yes, score 2.	
5. Is it an observational study with data on relevant confounders? If yes, score 1.	
6. Is there collected data on important covariates used in an analysis? If yes, score 1.	
Data Presentation and Statistical Analysis	
7. Are statistical methods clearly described? If yes, score 1.	
8. Are confidence intervals or P-values used? If yes, score 1.	
9. Are multivariate methods in analysis (e.g., regression) used? If yes, score 1.	
10. TOTAL SCORE – Maximum score possible is 10 (transfer total to the Classification Matrix)	

Appendix G. JSPTIPWG Criteria for Ranking Physical Training Injury Interventions

Intervention Name: _____

Intervention No. _____

Purpose: This score sheet is a tool that provides a systematic means of rating an injury prevention intervention and objectively comparing total scores of competing interventions.

How to use this score sheet: Complete a score sheet for each intervention under consideration. First, decide on a *preliminary rating* (1 = low, 5 = high) for each criterion. Then assign a *final score* for each criterion using the formula presented. Adding the final scores will provide a *total score*. The maximum total score is 100.

Criterion*	Total points possible*	Preliminary score	Final score (preliminary score/5 X total points possible)
1. Strength of the evidence (quality of science)	20	1 2 3 4 5 Low High	___ X 20 = 5
2. Magnitude of Net Effect <ul style="list-style-type: none"> Size of health benefit Size of population affected 	20	1 2 3 4 5 Low High	___ X 20 = 5
3. Practicality <ul style="list-style-type: none"> Feasible Start-up cost Acceptable Existing infrastructure 	20	1 2 3 4 5 Low High	___ X 20 = 5
4. Timeliness of reduction <ul style="list-style-type: none"> Implementation time Result Time 	10	1 2 3 4 5 Low High	___ X 10 = 5
5. Sustainability <ul style="list-style-type: none"> Effort to keep going Maintenance cost Training 	10	1 2 3 4 5 Low High	___ X 10 = 5
6. Measurable outcomes <ul style="list-style-type: none"> Measurable reductions 	10	1 2 3 4 5 Low High	___ X 10 = 5
7. Collateral benefit (e.g.: <ul style="list-style-type: none"> Increase readiness Decrease attrition Decrease in other health problem, etc. 	10	1 2 3 4 5 Low High	___ X 10 = 5
TOTAL SCORE	100		

*Criteria and total points adapted from the Defense Safety Oversight Council Criteria, 2004.

Date of Review: _____

Name of Reviewer: _____

Appendix H. Criteria for Determining Studies to Include or Exclude When Evaluating the Scientific Evidence

	Study Type	Definition
INCLUDED STUDIES <i>Original research studies + reviews of original research = scientific evidence.</i>	Injury research studies with injury outcome(s)	Original research studies that present the methods, results, and conclusions of an original scientific investigation and include injury as measured outcome. Intervention studies, risk factor/cause studies, descriptive epidemiology studies, and case series (defined in Appendix B) are included in this category if injury is a measured outcome. All of these studies should be categorized into the Intervention, Risk Factor/Cause, Descriptive Epidemiology, or Case Series columns of the Classification Matrix.
	Other research studies with non-injury outcome(s)	These are original research studies (e.g., field, epidemiological, lab, or biomechanical) related to your topic that <i>do not measure injury</i> , but rather measure <i>intermediate</i> outcomes (e.g., a stretching study measuring flexibility, a PT program measuring improvements in fitness, biomechanical studies examining shock absorbency of footwear). All of these studies should be classified as Other Research Studies in the Classification Matrix.
	Reviews of injury research	Review studies that describe the results of original scientific investigations and include injury as a measured outcome. All of these studies should be categorized into the Reviews column of the Classification Matrix.
EXCLUDED STUDIES	Research studies on a different topic	Studies presenting original scientific investigation that were culled from the initial search, but are not directly relevant to your topic. All of these studies will be excluded from the Classification Matrix.
	Non-research studies	Studies that do not describe original scientific investigation(s) or do not review original research. Examples include editorials, letters, opinion papers, and educational articles. All of these studies will be excluded from the Classification Matrix.

Appendix I. JSPTIPWG Study Definitions

Study Type	Definition
Injury Intervention Studies	Studies specifically examining interventions compared to controls where injury is the primary outcome (e.g., randomized trials, convenience sample comparisons of two cohorts, historical controls—pre and post studies of the same population, etc.). These studies include a numerator and denominator.
Injury Risk Factor/Cause Studies (Analytic Epidemiology)	These studies look at the incidence, rates, risks (percentages), or prevalence of injuries in different groups compared to each other. For example, a study that uses a cohort of individuals to look at the association of injuries with different degrees of exposure (such as amount of running or marching) or different levels of factors (such as fitness or percent body fat). These studies include a numerator and denominator and can be prospective or retrospective cohort studies, case-control studies, cross-sectional studies, or surveys.
Descriptive Injury Epidemiology Studies	These studies look only at risks and rates of injuries in a single group without reference to comparison groups or levels of risk factors or exposures (e.g., rates of injuries associated with running, marching, wearing of boots, etc.). These studies include a numerator and denominator.
Injury Case Series	These studies look only at cases or series of cases of injuries but do not have a denominator. These may provide us a distribution of causes or risk factors among the injured only. They may also provide a distribution of types of injuries associated with a type of activity or setting. Comparisons to other populations are not possible.
Other Research Studies	These are original research studies (e.g., field, epidemiological, lab, or biomechanical) related to your topic that <i>do not measure injury</i> , but rather measure <i>intermediate</i> outcomes (e.g., a stretching study measuring flexibility, a PT program measuring improvements in fitness, biomechanical studies examining shock absorbency of footwear).
Injury Review Studies	These reviews should include only reviews of studies relating to a particular injury problem or intervention and MUST have injuries as one of the outcomes considered in the review.

Appendix J. JSPTIPWG Risk Factor/Cause of Injury Study (Analytic Epidemiology) Quality Scoring Form*

Author/Year/Title of Risk Factor/Cause Study:	
Date of Review:	Name of Reviewer:
Problem and Sample	Score
1. Is there a clear statement of research question or hypothesis? If yes, score 1.	
2. Is it stated that a power or sample size calculation was done? If yes, score 1.	
3. Is the source of subjects or sample described (e.g., inclusion and exclusion criteria listed)? If yes, score 1.	
4. Is the measurement of exposures/risk factors and outcomes clearly described? If criterion fully met, score 2; if partially met, score 1.	
Study Design and Methodology	
5. Is this a prospective cohort study? If yes, score 2. <i>or</i> Is it a retrospective cohort or case control study or other appropriate design? If yes, score 1.	
6. Is data on relevant confounders provided and controlled for appropriately? If criterion fully met, score 2; if partially met, score 1.	
7. Is there data collected on important covariates used in an analysis? If yes, score 1.	
Data Presentation and Statistical Analysis	
8. Are statistical methods clearly described and appropriate? If yes, score 1.	
9. Are incidences (rates), risks (percentages), or odds of injury reported appropriately? If yes, score 1.	
10. Are confidence intervals or P-values used appropriately? If yes, score 1.	
11. Are multivariate methods in analysis (e.g., regression) used appropriately? If yes, score 1.	
12. Are demographic variables and associated risks/rates described appropriately? If yes, score 1.	
13. TOTAL SCORE – Maximum score possible is 15	
14. TOTAL SCORE CORRECTED to 10-point scale = points from line 13 x .667 (transfer total to the Classification Matrix)	

* Significant contributions to content and design of this form made by the following JSPTIPWG members: LtCol Vincent Fonseca, Dr. Julie Gilchrist, and Dr. Stephen Marshall.